Available online at www.sciencedirect.com
ScienceDirect
Renewable and Sustainable Energy Reviews
12 (2008) 772–789
RENEWABLE & SUSTAINABLE ENERGY REVIEWS
www.elsevier.com/locate/rser

Promotion of energy efficiency in Lithuania

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Received 28 July 2006; accepted 13 October 2006

Abstract

This article analyses energy efficiency development in Lithuania since 1990 and the main legal, fiscal and financial and institutional measures implemented in Lithuania aiming to promote energy efficiency improvements. Energy intensity currently in Lithuania is almost 1.2 times higher than in EU-15 average but the trends are positive and energy intensity has declined by 2.25 times during the investigated period. The paper presents final and primary energy intensity trends in Lithuania and concludes that measures implemented in Lithuania had positive impact on energy efficiency improvements. The main driving forces for energy efficiency improvements in Lithuania were energy prices increase with regained independence form Russia and EU approximation.

Keywords: Energy efficiency; Measures to promote energy efficiency

Contents

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1364-0321/$ - see front matter
doi:10.1016/j.rser.2006.10.002

1. Introduction

Energy saving or increase of energy use and supply efficiency is the most efficient measure to implement all other priorities of EU sustainable energy policy: increase security of energy supply, reduce pollution and environmental energy impact, reduce vulnerability of low-income population in energy affordability and ensure competitiveness and growth of economy and employment. An effective energy-efficiency policy could, therefore, make a major contribution to EU competitiveness and employment, which are central objectives of the Lisbon strategy. By addressing energy demand, this policy is part of the EU policies on energy supply including its efforts to promote renewable energies. In addition, energy-efficiency equipment, services and technology are becoming increasingly important worldwide. If Europe maintains its prominent position in this area, resulting in the development and introduction of new energy-efficiency technologies in Europe first, this represents an important trade opportunity. Energy saving is without doubt the quickest, most effective and most cost-effective manner for reducing greenhouse gas emissions, as well as improving air quality, in particular in densely populated areas. It will, therefore, help Member States in meeting their Kyoto commitments. Europe needs to become a leading country in developing new policies for energy-efficiency improvements. There are several important legislations and policy documents adopted in EU aiming to increase energy efficiency (EE).

The EU Green paper on European Strategy for Sustainable, Competitive and Secure Energy (SEC (2006) 317) (EU, 2006) sets the main priorities for EU energy strategy: competitiveness of the EU economy, security of supply and environmental protection. These objectives should help to address central policy concerns such as job creation, boosting overall productivity of the EU economy, protection of the environment and climate change.

The Commission's Green Paper on EE COM (2005) 265 (EU, 2005) stresses the importance of energy-efficiency improvement for the controlling of demand growth and security of supply. According to estimates, the economic potential for improving EE in 2010 for all sectors combined is 20% of the total annual primary energy consumption of the current level. Recent 2006/32/EC Directive on energy end-use efficiency and energy services sets the targets for EU member states to reduce final energy consumption by 9% during the 9-year period until 2015.

2002/91/EC Directive on the energy performance of buildings sets target to realize a savings potential of around 22% by 2010 for energy used in heating, air-conditioning, hot water and lighting.

2004/8/EC Directive on the promotion of cogeneration based on a useful heat demand in the internal energy market aims to increase EE and improve security of supply by creating a framework for promotion and development of high efficiency cogeneration of heat and power based on useful heat demand and primary energy savings taking into account the specific national circumstances especially climate and economic conditions. The strategic goal of EU-15 is to double the share of electricity produced by CHP by 2010. Lithuanian National Energy Strategy adopted in 2002 establishes target to achieve the 35% of electricity produced from CHP up to 2020.

Implementation of requirements of these main directives described and other directives on efficiency requirements for heat generators, hot water boilers, luminescence lighting, electric appliances and labelling of electric appliances (Directives 78/170/EC, 82/885/EC, 92/42/EC, 93/76/EC, 96/57/EC etc.) were the main drivers for the implementation of energy-efficiency policies in Lithuania. Energy intensity currently in Lithuania is almost 1.2 times higher than in EU-15 average but the trends are positive and energy intensity has declined by 2.25 times during the 1990–2005.

The aim of the article is to analyse the energy-efficiency measures and policies implemented in Lithuania and the development of energy intensity in Lithuanian 1990–2004. The main tasks to achieve this goal:

- Analysis of energy intensity development trends in Lithuania.
- Analysis of legal, policy and institutional framework for promotion of EE in Lithuania.
- Analysis of measures to increase EE in specific sectors.
- Analysis of economic instruments to promote EE.

2. EE development in Lithuania

Improving EE, decreasing energy intensity of economy or decoupling economic development from energy use are important sustainable development objectives. The growth indices of overall energy productivity (total primary energy supply and final energy consumption per GDP adjusted at PPP) development during 1990–2004 in Lithuania are presented in Fig. 1.

As one can see from Fig. 1, primary and final energy intensity of GDP have been decreasing during 1990–2004 in Lithuania. It has declined by 2.25 times during the investigated period [1]. Final energy intensity of GDP was decreasing at a higher rate than the primary energy intensity of GDP. Energy intensity is decreasing at a significantly higher rate in Lithuania than in the EU-15. Though overall energy intensity is decreasing at a very rapid rate in Lithuania, the energy intensity in 2004 was still higher (1.2 times) for Lithuania than for the EU-15. In Lithuania, final energy and primary intensity of GDP decreased during the 1990–2004 period, while the corresponding per capita use also decreased up to 2000. Just since 2001, slow trends of energy consumption per capita increase can be noticed in Lithuania [2].

By analysing energy intensity at less-aggregated levels, an analysis of structural changes experienced in the Lithuanian economy in terms of value added produced by different sectors of the economy and corresponding energy intensities were investigated [3]. The structural changes of economy had a positive impact on the decrease in energy intensity. The largest increase in share of value added was in the commercial sector, which is the least energy intensive. In general, energy intensity has decreased in all sectors of the Lithuanian

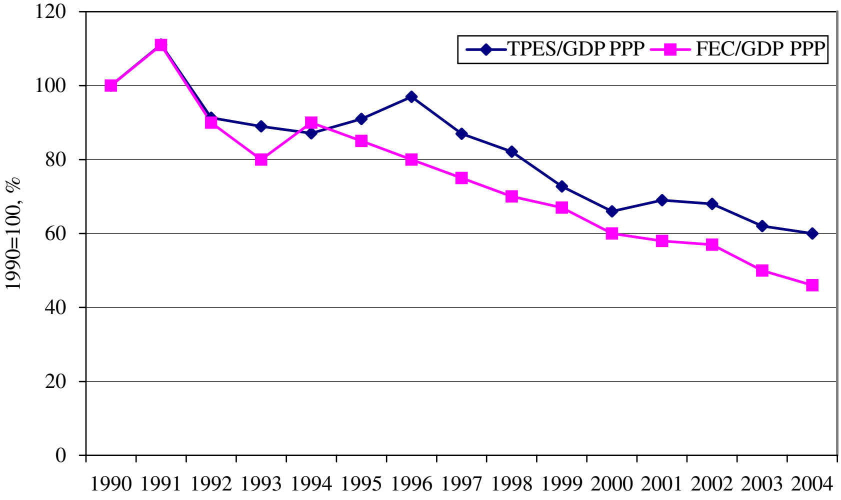


Fig. 1. Changes in energy intensity in Lithuania.

economy during the investigated period; however, the reduction of energy losses and implementation of EE measures are still priority areas in energy supply and use. As one can see from Fig. 1, the years 1995 and 1997 and 2001 indicate changes in trends of energy-intensity growth indices. The years 1995 and 2001 are the turning points of economic recession in Lithuania. Since 1995 and 2001 (after Russian crisis in 1999), the Lithuanian GDP began to grow. This growth was followed by some TPES/GDP increase. The year 1997 is also specific for Lithuanian economy, as since 1997, all energy prices have been finally raised to cover all production and supply costs. This had significant impact on energy consumption and energy-intensity decrease.

Energy prices were low and stable for long periods of time and uniform over large regions of the former Soviet Union. In the middle of 1992, when the prices for the Russian crude oil and natural gas sharply increased and started to converge to international prices, the price shock to the final consumers in Lithuania became unavoidable. The Government quickly liberalized the oil product prices, but they did not increase significantly as active businessmen were buying them cheaply in the Russian cheap markets and importing to the country. But natural gas prices increased steeply, and it caused increases of the district heating prices also.

Finally, in 1997, the Government made two decisive steps: separated the vertically integrated monopoly "Lithuanian energy" company from the district heating activities and stopped to regulate energy prices. An independent Control Commission for Energy Prices and Energy Activities was established, which was empowered to fix energy prices using technical and economic, but not political principles. The energy sector prices and tariffs are still regulated, except of prices for petroleum products and solid fuels. Price regulation and control is strong in the electricity, heat and gas sectors.

3. Legal and policy framework for promotion of EE in Lithuania

The Energy Law adopted in 2002 defines the principal objectives of state energy regulation and priorities of energy policy in Lithuania: (1) security of energy supplies; (2)

energy resources and EE; (3) reduction of adverse effects of energy activities on the environment; (4) promotion of fair competition; (5) promotion of consumption of indigenous and renewable energy resources. According the Law the main tasks of the State and municipal institutions are: (1) ensuring optimum structure of the state energy sector; (2) creating preconditions for efficient energy sector activities; (3) ensuring uninterrupted energy supply and stability of the established quality parameters; (4) promoting energy and energy resources efficiency; (5) promoting consumption of indigenous and renewable energy resources; (6) encouraging enterprises to carry out energy audits.

Article 20 on Energy Efficiency of the Energy Law stipulates that the major guidelines for EE shall be set out in the National energy strategy, while measures for the implementation of the guidelines shall be defined in energy-efficiency programmes. The Energy Law requires that the imported, manufactured and sold hot-water boilers with the nominal heating power in the range of 4–400 kW, fired with liquid fuel or gas, must conform to the prescribed efficiency requirements. The imported, manufactured and sold heat generators for heating premises and/or water in the new or existing buildings used for non-industrial purposes must conform to the prescribed efficiency requirements. Also the imported, manufactured and sold domestic appliances, which use electricity and other types of energy must have appropriate energy-efficiency labelling. Enterprises having boilers and equipment using other energy resources with the nominal heating power of more than 0.4 MW are required to check efficiency of energy resources of these equipment in accordance with the established procedure.

Article 9 of Energy Law defines the main issues relevant to National Energy Strategy. The strategy shall determine energy-development trends for a 20-year period and shall be approved by the Parliament upon the recommendation of the Government. The strategy shall cover all energy systems; it shall be subject to revision at least every 5 years. The strategy shall provide for: (1) the safety of the national energy sector; (2) forecasts of demand, import and export of energy resources; (3) forecast of energy production demand; (4) improvement of the energy sector structure; (5) structure of energy resources consumption and its forecasts; (6) forecasts and means of reduction of the energy sector's adverse effect upon the environment; (7) development of consumption of renewable and indigenous resources; (8) EE; (9) necessary investment; (10) evaluation and building up of reserves of energy resources; (11) energy market development; (12) directions of improvement of energy sector management; (13) improvement of pricing etc. The Government shall approve a 5-year strategy implementation plan and programmes of action.

The National Energy Strategy, which was approved by Resolution of the Parliament in 2002 [4], formulated the key provisions of the Government on the restructuring and development of the energy sector for the period until 2020. The following strategic objectives of the Lithuanian energy sector have been set: (1) to ensure a reliable and secure energy supply at least cost and with minimum environmental pollution, as well as constantly enhancing the operational efficiency of the energy sector; (2) to liberalize electricity and natural gas sectors by opening the market in accordance with the requirements of EU directives; (3) to privatize energy enterprises subject to privatization in the natural gas transmission and distribution and power sector, as well as to continue privatization of oil refining and transportation enterprises; (4) to implement the EU environmental directives relevant for energy sector, as well as to ensure compliance with nuclear safety requirements; (5) to ensure that 90-day stocks of crude oil and petroleum products are built up by 2010; (6) to prepare for the decommissioning of the reactors of the

Ignalina Nuclear Power Plant, the disposal of radioactive waste and the long-term storage of spent nuclear fuel; (7) to integrate the Lithuanian energy systems into the energy systems of the EU; (8) to further develop regional co-operation and collaboration with a view to creating a common Baltic electricity market; (9) to pursue an active policy of integration into the Western and Central European electricity markets and ensure that conditions conforming to the Energy Charter, EU legislation and practices are applied to the transit of energy resources through Lithuania; (10) to increase the efficiency of district heating systems; (11) to achieve that the share of the electricity generated in the combined heat and power operation mode would account for at least 35% in the electricity generation balance at the end of the period; (12) to strive for a share of renewable energy resources of up to 12% in the total primary energy balance by 2010; (13) to improve energy sector management, i.e. strengthen institutions in the sector, improve the skills and knowledge of specialists of those institutions.

The revision of the Law on Electricity adopted by the Parliament on 1 July 2004 essentially corresponds to the provisions of the EU Directive on Electricity relating to the opening of the market and its supervision. The Law establishes the fundamentals of electricity generation, transmission, distribution and supply in the Republic of Lithuania and relationship of suppliers of electricity services and users as well as conditions promoting competitiveness in electricity sector. In 2000, the Law on Natural Gas introduced general principles of functioning of gas sector as well as the activity of gas companies and their relations with users (in supply, distribution and storage of natural gas). In 2003, the Law on Heat was adopted. The present Law shall regulate the state management in the heat sector, the activity of subjects of economy acting in the heat sector, their relationship with heat consumers, their interrelationship and responsibilities. In 2004, the Law on Biofuel, Biofuels for Transport and Bio-oils was adopted. This Law shall regulate legal conditions of the production and use of biofuel, biofuels for transport and bio-oils.

The National Energy Efficiency Programme 2006–2010 was adopted in 2006 [5]. The National Energy Efficiency Programme foresees the key measures for energy-efficiency improvement like drafting of legal acts and regulatory, technical documents intended for the implementation of the National Energy Efficiency Programme, renovation of buildings, modernization of their heat economy, use of renewable, local and waste energy sources, efficient energy use in production processes, promotion of research and development in EE and use of RES, information, education and consultation activities. Further implementation of the Programme will not only have an impact on more efficient use of energy and energy resources, but will also ensure that the share of the renewables in the primary energy balance will reach the one indicated in the Accession Treaty, and, taking into account Directive of the European Parliament and of the Council 2001/77/EC of 27 September 2001 on the promotion of electricity produced from renewable energy in the internal electricity market, will ensure that the share of electricity generated from these sources by 2010 will amount to 7% of the gross national electricity consumption. The Programme evaluated annual economical energy-saving potential in private buildings—5.2 TWh and in public buildings—2.5 TWh. Energy-saving potential in transport is 0.92 TWh. The financing sources for the implementation programme in 2005–08 are presented in Table 1.

Special Programme for Implementation of Energy Saving Measures was established in 2000. This programme is established for financing programs of energy conservation and its

Table 1
Means for implementation of National Energy Efficiency Programme for 2005–08 period, thou Lt

Financing	Assignmnet for year 2005	Request for year 2006			Project for year 2007	Project for year 2008–
		Basic budget	Changes	Total		
All financing sources	2006	2006	−50	1956	2006	2006
State budget	2006	2006	−50	1956	2006	2006

1EUR = 3.452 Lt.

Table 2
The means of Special Programme for Implementation of Energy saving Measures for 2005–07 period, thou Lt

Financing	Assignments for 2005	Request for 2006			Projected for 2007	Projected for 2008
		Basic budget	Changes based on new budget	Total		
Financing sources	7417.8	7417.8	+1985.3	9403.1		
State budget	1985	1985		1985	906	1000
Other sources	5432.8	5432.8	+1985.3	7418.1		

effective utilization and for implementation, operation and development of utilization means of local, renewable and by product energy resources. The programme resources are used for granting loans to finance programmes and projects dealing with energy conservation and effectiveness, for introduction, operation and development of utilization means of local, renewable and by-products energy resources. The Special Programme for Implementation of Energy Saving Measures carries out the function of Energy Efficiency Fund, which was operating in Lithuania from 1996 up to 2000 [6]. The financial contributions from state budget assigned for Special Programme for 2005–07 period are presented in Table 2.

4. Measures to increase EE in specific sectors

4.1. Households and public buildings

In order to timely implement the provisions of Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings in the national laws, the Minister of Environment and the Minister of Economy in 2004 approved the measures and terms of the implementation of the provisions of the Directive in Lithuania. In 1999, Construction Technical Regulation establishing main requirements of EE and heat conservation in buildings (energy metering devices, minimum requirements for partition walls) was approved.

In 2004, the Government of the Republic of Lithuania approved the Lithuanian Housing Strategy [7]. One of the key objectives of the strategy is to ensure efficient use, maintenance and modernization of the existing housing stock, and rational use of energy resources. The strategy provides for, by 2020, modernization based on the economic

feasibility principle of heating systems in the existing multi-apartment buildings, renovation and insulation of roof structures, change or replacement of windows and entrance doors, removal of joint defects of panel walls and increase of the thermal resistance of external walls, as well as reduction of heat energy costs per unit of useful floor space up to 30%. The strategy sets forth that it is necessary to establish an adequate funding and crediting mechanism using the experience gained during the implementation of the Energy Efficiency/Housing pilot project, crediting resources of Lithuanian banks, housing credit insurance and state assistance in cash to low-income households, and also potential support of international financial institutions and funds. For the purpose of increasing EE in the housing sector, owners of apartments in multi-apartment buildings are encouraged to form homeowners' associations. Such associations are provided with support and education and consulted on issues of house maintenance and energy management. Owners of multi-apartment buildings, who participate in programmes developed by the Government of the Republic of Lithuania, may receive financial support for the implementation of energy-conservation measures in their buildings.

Based on provisions of national energy strategy and by implementing Lithuanian Housing Strategy [7] and measures for the implementation of Lithuanian Housing Strategy for 2004–06, Government adopted the programme for the financing of modernization of multi-flat buildings [8]. The main aim of the programme is to help owners of multi-flat houses to modernize multi-flat buildings, increase efficiency of energy use, reduce heating expenses and ensure favourable conditions for low-income population to modernize their apartments in multi-flat buildings. The main tasks of the programme are: to create favourable conditions for commercial banks to finance modernization of multi-flat buildings; to ensure that credits provided from commercial banks would be accessible for communities of households in multi-flat buildings; to support low-income population allowing them to participate in modernization projects of multi-flat buildings; to ensure the good quality of modernization projects implementation; to ensure all kinds of support and financial, technical and organizational consultancy for communities of households in the field of implementation of modernization projects.

The means for the modernization of multi-flat buildings consists from means of households, loans of commercial banks and state-targeted support. The assignments from state budget for the implementation of this programme in 2006 are presented in Table 3.

4.2. Energy supply

Energy sector development trends followed in the past mainly focused on the concentration of the production of energy resources and their centralized distribution in order to facilitate their management. Therefore, the increase in energy demand resulted in construction of major power plants. The systems of resources of the companies were intended for energy export. The condition of electricity sector during the last year's improved and technological losses of electricity transmission and distribution decreased. Attempts to preserve the central heat supply systems, while developing CHP, would result in considerable enhancement of efficiency of primary energy consumption and reduction of emissions. The condition of heat sector during the last years improved. Technological and realization losses of heat transmission in 2004 compared with 1996 decreased by 2 times. This was achieved by improving the technical condition of heat networks as well as through the attempts to find optimal alternative heat transmission method. The feed-in

Table 3
The state budget means allocated for the implementation of measures foreseen in pogramme for the financing of modernization of multi-flat buildings in 2006

Measures	Means, thou Lt
Organization of monitoring of programme implementation and methodological support by preparing annual report on programme implementation	50.0
Information on programme implementation and on support provision issues dissemination through mass media	50.0
The administration of state support for multi-flat buildings modernizations by implementing functions foreseen in the regulations for the evaluation of energy efficiency of investment projects	600.0
State support for multi-flat buildings modernization	6300.0
Total	7000.0

prices for electricity produced from CHP and introduction of EU GHG emission trading scheme are the major tools having impact on efficiency of energy supply in Lithuania.

4.3. Transport

The long-term transport system development strategy up to 2025 was adopted on June 2005 by the Government Decree [9]. The main aims of the strategy are: promotion of creation of a cost-effective transport system coordinating development of all types of transport; giving priority to a more environmentally friendly transport; increase of the efficiency of the energy transport sector; enhancement of the use of alternative and less polluting fuel; reduction of environmental pollution.

One of the key targets of modernization and development of road transport is to encourage people to use public transport services in order to prevent increase of automobile traffic and road network load, especially in large cities. Medium-term measures for road public transport are directed towards the balancing of public line transport services and use of automobiles, change of modal distribution of city transport (taking into account national territorial development principles and EU directives), giving priority to public transport, pedestrians and cyclists and are as follows [9]: (1) to modernize stocks of passenger transport companies, to apply ‘‘clean’’ technologies to passenger transportation and to introduce modern information system for the management of public line transport in cities; (2) to integrate services of external and internal passenger transport promoting a single-ticket system, connecting terminals of external passenger transport (air, sea, river harbours and railway stations) with the internal transport system and ensuring qualitative accessibility in cities and towns; (3) to restructure tariff and ticket systems so that they could meet socio-economic conditions and possibilities of inhabitants of Lithuanian cities as well as ensure adequate earnings and facilitate more active use of public transport; (4) to introduce modern public line transport systems, to promote electricity-driven environmentally friendly transport; (5) to adjust use of automobiles to the schedule of the public line transport system, to construct parking places at the points of changing to public line transport, to restrict and to prohibit automobile traffic in old towns and central parts of cities as well as in dense residential centres where pedestrian and non-engine transport

zones should be constructed. One of the short-term objectives provided for in the Transport Strategy is to create economic and legal conditions for the development of more environmentally friendly and safer transport, to enhance the use of less hazardous fuel (liquefied and natural gas, low-sulphur heavy fuel oil) and alternative fuel (biodiesel, bioethanol). The key objectives of the modernization and development of road transport include creation of an environmentally friendly road transport system giving priority to transport which has a lower adverse impact on the environment, increasing the EE of the road transport sector, enhancing the use of alternative and more environmentally friendly fuel thus reducing environmental pollution, encouragement of the use of clean fuel in public transport (applying a substitute amounting to 20% of all fuel), using electromobiles and hybrid automobiles for city tours, especially in the city servicing field, avoid traffic jams and air pollution in intensively visited city and town places.

The Law on Biofuel and Bio-Oil sets forth that the Government or institutions authorized thereby shall prepare measures ensuring that by 31 December 2005 biofuel must constitute at least 2% of the total amount of energy of petrol and diesel fuel intended for transport in the national market and by 31 December 2010 this amount shall be 5.75%. One of the key objectives of the Programme on Promotion of Production and Use of Biofuel for 2004–10 [10] approved by the Government Resolution is to ensure that by 2010 the production of biodiesel fuel from raw materials of local origin is increased to 40 thou t/year and the production of bioethanol by 2010 is increased to 20 thou t/year, as well as to enhance the use of biofuel, to establish mandatory indicators for the use of mixtures of mineral fuel and biofuel. The Regulations on the Marketing of Oil Products, Biofuel, Bio-Oil and other Combustible Liquid Products in the Republic of Lithuania approved by the Minister of Economy in 2005 set forth mandatory requirements for mixing oil products marketed and used in the country with biofuel. With the view to promote development of biofuel production and provide conditions for the use of agricultural products for non-food purposes as well as to improve the ecological situation in the country, in 2004 Regulations for the Financing of Development of Biofuel Production were approved by Order of the Minister of Agriculture, which provide for monetary compensations to biofuel producers for losses of rape seeds methyl (ethyl) ester and grain-derived bioethanol production due to the high price of the material (rape seeds and grains) used for the production of biofuel. The compensations to producers of biofuel are 46.3 €/t of rapeseeds grown in the Republic of Lithuania and bought for the production of rapeseeds methyl (ethyl) ester, and 17.4 €/t of grains grown in the Republic of Lithuania and bought for the production of bioethanol. The increase of the excise tariffs for energy products (engine fuels or their additives, fuel intended for heating) for the purpose of final harmonization of the excise tariffs with the EU acquis, together with the increasing prices of these products will enable more efficient use of the existing energy products and conversion to alternative energy sources.

Pursuant to the said Law, energy products produced from materials of biological origin shall be applied a tariff reduced by such share which is in proportion to a share (in percentage) of materials of biological origin in 1 ton of a product. The Law on Pollution Charges has set forth that legal and natural persons, upon presentation of documents proving consumption of biofuel, shall be exempted from the payment of the charge for air pollutants emitted from mobile and stationary pollution sources.

4.4. Industry

Information booklets, newsletters, special editions on efficient use of energy and measures in industries are regularly prepared and published. Seminars and training courses for senior management in industry are arranged. Six to 10 seminars are arranged and conducted each year, including training courses on possibilities of improvement of EE in industry. In implementing Law on Heat, several seminars for specialists of municipalities on the issue on the preparation of Municipal Heat Special Plans were held.

For the purpose of introducing the Western experience in introduction of new technologies taking into account EE, a book "Efficient Use of Energy in Bread Industry" was prepared and published in 2001.

In 2005, a publication for senior management of small and medium size enterprises (SMEs) on efficient management of the energy sector in enterprises is planned to be prepared. CD containing information in energy management in industries was prepared and released. Also, the following publications were prepared: "Energy Management Guide"—on energy management in industries, "Guide on Energy Audit in Industries"—on performance of energy audits in industrial buildings, as well as the following information publications: "Energy Management–Energy Efficient Production", "Audit of Energy Consumption in Industry", "Energy Audit in Industry", "Energy Efficiency".

There are just few energy service companies (ESCO) (Dalkia, Litesko, E-enerija, etc.) operating in Lithuania. All these companies are leasing district heat supply systems from municipalities. There are no ESCO operating in industry sector.

5. Economic instruments to promote EE

5.1. Energy prices

Energy tariffs regulated by the state are determined by the Commission on the basis of assessment of the validity of the return on investment and activity expenditures. Expenditures required for environmental projects are included into calculations of the prices regulated by the state. The principle of the Methodology for Pricing of Centrally Supplied Heat and Hot Water was approved in 2003, in more environmentally friendly fuel. The period of the base tariffs set observing this methodology is from 3 to 5 years. During this period enterprises can convert from imported fuel (e.g. heavy fuel oil) to cheaper fuel (in this case-biofuel). When doing annual calculation during the base tariff period the fuel composition is not changed; therefore, conversion to cheaper fuel at the beginning of the tariff price period yields profit gained due to the fuel tariff difference, which facilitates return on investments. Also, every year, the Commission approves feed-in tariffs of electricity generated in cogeneration power plants. The average feed-in tariff of such electricity in 2005 is 1.2–1.4 times higher than the average electricity generation tariff in the country. Pursuant to the Republic of Lithuania Law on Energy, the Commission approves the feed-in tariff of electricity generated from renewable sources. The Commission in 2002 approved feed-in tariffs of electricity generated from renewable and waste energy sources (for hydro power plants—5.8 €ct/kWh; for wind power plants—6.4 €ct/kWh and for power plants producing electricity from biofuel—5.8 €ct/kWh, which are ca. 2.5 higher than the average-calculated electricity generation tariff in Lithuania.

Electricity is exempted from the excise duty if electricity is generated from renewable energy sources (RES).

5.2. Fiscal measures

There are some taxes exemptions in Lithuania. Standard rate of Value Added Tax (VAT) is 18%. Rate of VAT for the heat for residents is only 5%. The difference between 18% and 5% shall be covered from state budget of the Republic of Lithuania in the amount of 13% pursuant to the procedure established by Government of the Republic of Lithuania. Rate of VAT for the construction of the housing, insulation and renovation of buildings is 9%. The difference shall be paid from the state budget and municipal funds as well as from soft credits granted by the state and state special funds. Rate of VAT on export is 0%.

The Law on Amendment of the Excise Law adopted in 2004 provides for the power produced from the renewables to be exempted from the excise tax; an excise grace is applied to the part of biofuel corresponding to the part of additives of biologic origin in one ton of the product. The Law on Environment Tax as well as the Laws on the Supplement and Amendment of the said Law establishes that legal and natural persons shall be exempt from the tax applicable for environment pollution by mobile and stationary pollution sources if the said persons use standard biofuels and provide written evidence of the usage of said biofuels.

5.3. Soft loans and investment subsidies

The Lithuanian Environmental Investment Fund (LEIF) was founded on November 11, 1996, as a public institution. The founder of the LEIF is the Ministry of Environment. The European Commission, which took an obligation to allocate the capital of 3 million euro and technical assistance, and the USA International Development Agency, which allocated to the Fund a technical assistance of 50,000 USD, has supported the establishment of the Fund. The main goal of the LEIF is to support public and private sectors in realization of environmental projects and projects to reduce the negative impact of economic activities on environment in compliance with the Environmental Strategy of the Republic of Lithuania. The Fund supports investment projects in the form of soft loans and subsidies. The Supervisory Board of the Fund establishes on annual basis, which type of applicants and which field of environmental investments shall be granted the aforementioned types of financing.

By applying the aforesaid types of financing, the fund provides financial support for environmentally beneficial investment projects of legal bodies duly incorporated in the Republic of Lithuania and engaged in economic activities, as well as appropriate projects of natural persons and municipalities, the implementation of which reduces negative impact on environment by the economic activities. Only the projects ensuring the sustainability of environmental effect are supported. The main source of the LEIF is 20% (since 2003—30%) of the pollution tax paid to the LEIF since the year 2000 on the basis of the Law on Environmental Pollution Tax. According to preliminary calculations, it should make about 12 million Litas per year. Phare capital grant is another important financial resource of the Fund. The LEIF has already received 11.5 million Litas from Phare funds. The extension of LEIF loans for financing investment projects is made through

commercial banks, leasing companies, which can co-finance the projects as well as assume the risk for non-repayment of a loan.

The investment projects are financed using LEIF funds by providing soft loans and subsidies. Conditions for providing soft loan are the following: (1) the maximum amount of a loan for financing a single investment project shall make up to 1.5 million Litas; (2) the loan shall be provided only in national currency; (3) maximum term for the loan allocation is 5 years, if the loan is provided by the fund; (4) fund loans are provided through Credit Institutions (Commercial Banks, Leasing Companies) which assume the risk for loan non-repayment and which provide at least 30% of the loan amount from their own fund; (5) fund does not calculate interest for its part of the loan; the interest is dependant on the margin set by the Credit Institution.

Conditions for providing subsidies are the following: (1) the amount of the subsidy to one beneficiary may not exceed 350,000 Litas in 3 years and 70% of the total amount of investment in environmental-protection measures; (2) subsidies from the money of the Fund may be granted to beneficiaries only together with a loan provided by a Credit Institution (Commercial Bank, Leasing Company) for financing of the implementation of the beneficiary's project; (3) subsidies may be granted to municipalities and enterprises of municipalities regardless of whether a Credit Institution is financing their projects or not; (4) the Fund may grant subsidies only for partial or total covering of a loan provided by a Credit Institution; (5) Fund payments to the beneficiaries are made on the basis of an agreement on subsidies through a Credit Institution; (6) the subsidies are repaid after a beneficiary has fully completed implementation of the project; (7) subsidies are granted in national currency of the Republic of Lithuania. The LEIF supports projects in EE improvements and use of RES.

5.4. Use of structural funds

The Lithuanian Single Programming Document (2004) [11] is being implemented by specific strategies described in five Operational Programmes (OP):

(1) Development of social and economic infrastructure.
(2) Development of human resources.
(3) Development of productive sector and services.
(4) Rural development and fisheries.
(5) Technical assistance.

EE projects can be implemented using the schemes from 2 OP: development of social and economic infrastructure and development of productive sector and services. The main priorities of the development of social and economic infrastructure relevant to EE are under priority 1.2: ensuring of energy supply stability, accessibility and increased efficiency which include 3 sub-priorities relevant to sustainable energy projects [11]:

Priority ID 1-2.2: Renovation of boilers and biomass or natural gas conversion.
Priority ID 1-2.3: Local and RES.
Priority ID 1-2.4: Increase of EE in public sector.

The main objective of measure 1.2 is to ensure stability, reliability, flexibility and accessibility of energy supply, increase of EE and to form a basis for the stable growth of national economy. Particular subgoals relating to EE or RES: renovation of boilers and switching to other fuels in the combustion plants currently burning less environmentally friendly fuels (especially burning high sulphur content petroleum products); increase the use of RES; increase of EE in public sector. Particular schemes for project submission: conversion of combustion installations to biomass, natural gas; adjustment of renovated boilers for CC; installation of new or adjustment of existing energy generation sources to use RES and municipal waste; implementation of new technologies, use of RES, municipal waste; renovation of buildings and heating installations; maintenance and control of energy use in renovated buildings; energy audits of buildings and infrastructure; regional cooperation, R&D related to EE improvements and energy market development in national and region al levels; feasibility studies, information dissemination, education, consultancy and scientific research in this field.

Eligible applicants: state institutions; municipalities and their institutions; public bodies; subjects eligible under the condition of state aid provision: "promotion of entrepreneurship, business and investments development": (1) de minimis support, (2) support to SME, (3) regional aid detailed eligibility requirement are defined during the call of proposals. Eligible projects: reduction of negative impact on environment; increase of reliability of energy supply; use or promotion to use RES; increase of energy use efficiency; implementation of advanced technologies.

The funds allocated for priority 1.2: ensuring of energy supply stability, accessibility and EE in Lithuania 2004–2006: 82.76 MEUR.

The main priorities of OP 3: productive sectors relevant to EE improvements are:

Priority ID 3-1.1: implementation of new technologies.
Priority ID 3-1.12: implementation of environmental measures.

As regards investors preparing projects resulting in increased EE, energy savings, the possibility to acquire assistance through SF is primarily orientated to the Measure ID 1.2 (Table 4).

The main objective of Measure 3.1 is to increase competitiveness of companies and the level of entrepreneurship, to balance equal opportunities in business, to increase the potential of scientific research in business.

Particular subgoals relating to EE or RES: implementation of new technologies and innovations; implementation of environmental measures. Particular schemes for projects submission: new products and service development; new technologies and innovations, modernization of production equipment; improvement of production and service processes; R&D for industry; integration of R&D in business; quality management systems; implementation of standards and certification systems; establishment of industry and business collaboration clusters; implementation of cost-reduction measures including EE measures. Eligible applicants are SMEs. Eligible projects are that created of high VA products, increase of competitiveness, internalization, positive impact on R&D, cooperation among business and research institutions. The community support for Priority 3.1 in Lithuania for 2004–06: 77.33 million euro.

Table 4
The projects financed by priority *ID 1–2.4:* Energy efficiency improvement in public buildings

Energy efficiency improvements in public buildings	The means allocated for project, Lt				
	Total support, Lt	Sub-total	European Union	Lithuanian Republic	Other
The means allocated for 63 projects	93 581 712	100 301 682	68 314 650	25 267 062	6 719 971

5.5. Market-based tools

There are several market-based mechanisms aiming to achieve EE or having impact on achievement of this aim:

- A Tradable White Certificate (TWC) scheme would aim to encourage energy-saving measures to deliver end-use energy savings, reducing energy consumption and CO_2 emissions [12].
- The European Union Emission Trading Scheme (EU ETS) aims at promoting reductions of greenhouse gases emissions in a cost effective and economically efficient manner [13].
- Flexible Kyoto mechanisms (Joint Implementation [JI] and Clean Development Mechanisms [CDM]) have the same aim as EU ETS just on the broader area outside the borders of EU [14,15].

The implementation of the EU ETS and Flexible Kyoto Mechanisms (JI) in Lithuania has impact on energy end-use efficiency [16]. There are no white certificates systems introduced in Lithuania yet. At present, however, the incentives provided by the Kyoto mechanisms, including the possible use in the EU ETS of credits generated through JI or CDM project activities are not sufficient to support EE projects. This is particularly the case for small-scale EE projects where the transaction costs are too high to use of JI.

6. Institutional structure to promote EE

With the view to implement the National Energy Strategy and in the process of enforcement of Lithuanian energy legislation the following institutions have been strengthened: the State Energy Inspectorate (hereinafter-VEI), the National Control Commission for Prices and Energy (hereinafter referred to as the Commission).

The VEI under the Ministry of Economy, following the Methodological Guidelines for Energy Efficiency Inspections, carries out EE inspections in energy enterprises, which generate, distribute, supply and consume energy. Four hundred and forty two EE inspections were performed during the period 2003–04. Upon the inspections, instructions were developed for the enterprises listing the facts of inefficient energy use and providing recommendations for the improvement of activities in this area.

The VEI controls that heat generators supplied to the market, delivered for use and used are in conformity with the established efficiency requirements, and the insulation of a heat and hot water supply system meets the requirements of heat losses as indicated in the

Technical Regulation on New Hot Water Boilers Using Liquid or Gas Fuel and in the Technical Regulation on Inspection of Efficiency of Heat Generators and Insulation of Heat and Hot Water Supply Systems in Buildings of Non-Industrial Purpose. The regulations have been drafted observing the requirements of EU directives. Information and technical consultations regarding VEI practical use of EE measures were provided to the staff of the by the state enterprise Energy Agency. As a supporting working means, information publications were distributed to the staff of the Inspectorate. The Commission is given additional functions to supervise activities of the operators of transmission and distribution networks (compliance with rules of distribution and regulation of throughput of lines connecting individual systems, the rate of connection of new customers, effectiveness of separation of the accounting of different activities, etc.), to carry out market monitoring and supervision, to control reliability of supply and quality of services. The main task of the Commission is to supervise the markets of electricity, natural gas, heat and water economy observing the procedure established by legislation.

When carrying out the task delegated thereto, the Commission performs the following functions: (1) approves methodologies for setting prices regulated by the state; (2) establishes upper limit prices regulated by the state; (3) establishes the procedure for regulation of prices of electricity and reserve power for electricity generators and independent suppliers who cover more than 25% of the market as well as the procedure for regulation of balancing energy prices; (4) approves feed-in tariffs of electricity generated from RES; (5) approves connection tariffs for electricity and natural gas objects (networks, systems, equipment); (6) while setting prices regulated by the state, assesses justification of return on investments and activity expenditure; (7) issues, suspends, cancels licences for energy transmission, distribution, storage, and supply pursuant to the Licensing Regulations approved by the Government of the Republic of Lithuania, controls licensed activities of energy companies; (8) establishes whether users of electricity and natural gas may be acknowledged to be eligible customers and makes lists of eligible customers available to the public; (9) analyses conclusions of audit of activity costs of licensed energy companies; (10) controls application of prices and tariffs regulated by the state.

Article 10 of Energy Law defines the main functions and responsibilities of Energy Agency. The Energy Agency is a State enterprise. Its founder is the Ministry of Economy. Upon the assignment of the Ministry of Economy, the Energy Agency shall fulfil the following main functions: (1) carry out the measures of the strategy-implementation plan; (2) implement the programme for the improvement of EE and its action plan; (3) carry out the supervision and monitoring of the implementation of foreign assistance programmes and projects in the energy sector; (4) promote efficiency of energy resources and EE as well as the use renewable energy resources and provide information relating thereto. The Energy Agency shall also fulfil the functions prescribed by this Law and other laws or assigned by the Ministry of the Economy.

7. Conclusions

(1) Energy intensity has decline by 2.25 times during 1990–2004 in Lithuania however it is still 1.2 times higher than in EU-15 average.
(2) The years 1995, 1997 and 2001 are the turning points in energy intensity development in Lithuania. Since 1995 (after step economic decline started in 1991) and since 2001 (after Russian crisis in 1999) the Lithuanian GDP begun to growth. This growth was

followed by some TPES/GDP increase. The year 1997 is also specific for Lithuanian economy, as since 1997, all energy prices have been finally raised to cover all production and supply costs. This had significant impact on energy consumption and energy intensity decrease.

(3) The increase of energy prices and implementation of EU directives targeting energy efficiency increase are the main drivers of energy intensity decrease in Lithuania.
(4) New edition of the Law on Energy adopted in 2002 regulates general activity of energy sector, fundamentals of energy development and management and efficient usage of energy and energy resources. According to this Law, promotion of energy efficiency is one of the main subjects of state regulation and policy priorities in energy.
(5) Several strategies and programmes targeting energy efficiency increase were developed and implemented in Lithuania. The assignment from state budget for the implementation of these programmes makes about 15 million per year.
(6) There are several fiscal in Lithuania for the promotion of energy efficiency in Lithuania: reduced VAT from 18% up to 9% for insulation and modernization of buildings, feed-in prices for electricity produced from CHP.
(7) Since 1996, the Lithuanian Environmental Investment Fund provides financial support for environmentally beneficial investment projects of legal bodies duly incorporated in the Republic of Lithuania and engaged in economic activities, as well as appropriate projects of natural persons and municipalities, the implementation of which reduces negative impact on environment by the economic activities. The project on energy-efficiency improvement is supported in form of soft loans and investment subsidies.
(8) Eighty two million euro were allocated from the EU Structural Funds (namely, the European Regional Development Fund) for the period 2004–06 to upgrade and develop energy transmission and distribution networks (especially District Heating networks), to increase their reliability and efficiency, to introduce renewable energy sources for electricity and heat production and to increase efficiency of the energy consumption in public buildings.
(9) The implementation of the EU ETS and Flexible Kyoto Mechanisms (Joint Implementation) in Lithuania stimulates implementation of energy-efficiency measures. There are no white certificates systems introduced in Lithuania yet. At present, however, the incentives provided by the Kyoto mechanisms, including the possible use in the EU ETS of credits generated through JI or CDM project activities are not sufficient to support energy-efficiency projects in Lithuania because for small-scale energy-efficiency projects where the transaction costs are too high to use of JI. Implementation of white certificates trading would help to promote energy-efficiency projects in the most efficient way.

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